

THE CLAIMS

1. Flow through aqueous liquid purification apparatus for sterilizing water to a target SAL comprising:

5 a source which inputs an aqueous liquid to be purified at a predetermined flow rate to a pressurized heating chamber of said apparatus;

10 the heating chamber, through which the water flows while being heated, comprising a medium by which heat is thermally communicated to the liquid, an enclosed pathway for the liquid, said pathway being in thermal communication with the medium, and a heat source capable of heating and continuously maintaining liquid in the chamber pathway at a predetermined sterilizing temperature for a predetermined period of time;

15 the pathway comprising sidewalls capable of withstanding increased internal pressure of aqueous liquid heated to the sterilizing temperature; and

20 a pressure regulator downstream from the exit which assures upstream pressure within the pathway is at least a predetermined pressure consistent with the sterilizing temperature and flow rate to assure adequate sterilization of effluent aqueous liquid while retaining the liquid in the liquid state.

2. Flow through aqueous liquid purification apparatus according to Claim 1 further comprising a heating system for

heating the water flowing through the apparatus to a precise temperature while resident in the heating chamber.

3. Flow through aqueous liquid purification apparatus according to Claim 2 further comprising a heating bath comprising  
5 a material which changes state at the predetermined temperature.

4. Flow through aqueous liquid purification apparatus according to Claim 1 further comprising a temperature sensing switch disposed to sense the temperature of water in the heating chamber and to close at a first predetermined temperature and to  
10 open at a second predetermined temperature.

5. Flow through aqueous liquid purification apparatus according to Claim 4 further comprising a pressure sensing switch disposed to sense the pressure of water in the heating chamber and to close at a first predetermined pressure and to open at a  
15 second predetermined pressure.

6. Flow through aqueous liquid purification apparatus according to Claim 5 further comprising a valve in line with said water pathway, said operatively opening when said pressure sensing switch and said temperature sensing switch are both  
20 closed.

7. Flow through aqueous liquid purification apparatus according to Claim 1 wherein said source comprises a water pump assembly.

8. Flow through aqueous liquid purification apparatus according to Claim 7 wherein said water pump assembly comprises a variably controllable pump.

9. Flow through aqueous liquid purification apparatus according to Claim 1 wherein said regulator is a pop valve.

10. Flow through aqueous liquid purification apparatus according to Claim 1 wherein said source is a static reservoir and an associated flow control orifice.

11. Flow through aqueous liquid purification apparatus according to Claim 1 wherein said heating chamber comprises an electrical heat source.

15 12. Flow through aqueous liquid purification apparatus comprising:

a source which inputs an aqueous liquid to be purified at a predetermined flow rate to a heating chamber of said apparatus; the heating chamber, through which the liquid flows while 20 being heated, comprising a medium by which heat is thermally

communicated to the liquid, an enclosed pathway for the liquid, said pathway being thermally conductive with the medium, and a heat source capable heating a portion of the liquid in the pathway to a predetermined sterilizing temperature for a 5 predetermined period of time, consistent with the flow rate, before exiting the pathway;

the pathway comprising sidewalls capable of withstanding increased internal pressure of aqueous liquid heated to the sterilizing temperature;

10 a shut-off valve which is controllably opened to release liquid from the pathway only when temperature of the portion of liquid exceeds a first predetermined minimum sterilizing temperature and closes to restrict flow of liquid through the pathway when the temperature of the portion of liquid is less 15 than a second predetermined minimum temperature;

a second shut-off valve which is controllably opened to release liquid from the pathway only when pressure within the pathway is greater than a first predetermined pressure and closed when the pressure is less than a second predetermined pressure;

20 and

a pressure regulator downstream from the exit which assures upstream pressure within the pathway is equal to or greater than a predetermined pressure consistent with a predetermined minimum sterilizing temperature and flow rate to assure adequate 25 sterilization of the aqueous liquid before reaching the exit.

13. Flow through aqueous liquid purification apparatus according to Claim 12 wherein said first and second shut-off valves are the same valve.

14. Flow through aqueous liquid purification apparatus according to Claim 12 wherein said apparatus comprises a 5 temperature sensor which comprises a selectable a range of a maximum temperature and a minimum temperature which selectively determines an desired SAL for effluent aqueous liquid consistent with pressure levels maintained in the heating chamber.

10 15. Flow through aqueous liquid purification apparatus according to Claim 12 wherein said apparatus comprises a pressure sensor comprising a selectable maximum pressure and a minimum pressure, thereby determining a desired SAL consistent with 15 temperature levels maintained in the heating chamber.

15 16. Flow through aqueous liquid purification apparatus according to Claim 12 wherein said source comprises a pump and a pump controller for selectively controlling influent and therefore effluent through the apparatus and which can thereby provide a predetermined rate-volume availability which is 20 consistent with a desired SAL of the effluent.

17. A method for sterilizing aqueous liquids to a predetermined SAL comprising the steps of:

providing a source of influent contaminated aqueous liquid to be purified to the predetermined SAL;

5 providing a heating chamber, through which the aqueous liquid is steered and heated to a first predetermined temperature;

providing a pathway which traverses the heating chamber from the influent source to an effluent site from which aqueous liquid 10 of the predetermined SAL flows;

providing a first valve in the pathway down stream from said heating chamber, said valve restricting effluent flow until a first predetermined pressure is reached in the pathway;

providing a second valve in the pathway down stream from 15 said first valve, said second valve being closed to restricted effluent flow until a second predetermined temperature, which is selected as an adequate sterilization temperature for the SAL at preselected flow rates from the source, is reached by the aqueous liquid at a predetermined site in the heating chamber and until a second predetermined pressure is measured which assures that the aqueous liquid remains in the liquid state in the pathway;

20 initiating operation by closing the second valve;

initiating heating of the heating chamber to the first predetermined temperature;

25 initiating flow of the aqueous liquid from the source;

opening the first valve when the first predetermined pressure is reached; and

opening the second valve when both the second predetermined temperature and second predetermined pressure are jointly reached  
5 thereby assuring effluent of having the predetermined SAL.